RF Conductors

Noji Ratzlaff
KNØJI

noji.com/hamradio

RF

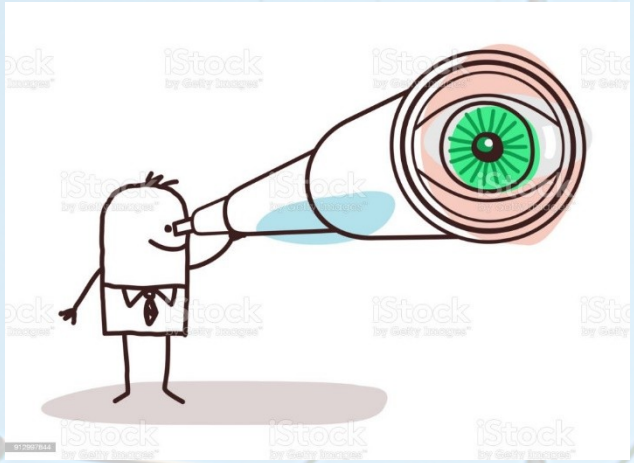
RF = radio frequency

RF signals in wires (electricity)

RF signals in space (waves)

We’re talking about the ones in wires

The scope of our discussion



Coax, ladder, and other feed lines

Wire antenna elements

Not

Power cables, power lines, appliance cords

Ethernet, USB, mic cables, guy wires

Random metallic objects

Which coax to use?

Keep it simple:

HF

< 100 feet = RG-8X

> 100 feet = LMR-400

VHF / UHF

< 50 feet = RG-8X

> 50 feet = LMR-400

Other coax varieties

RG-8/U, RG-213	Great, but lossier
RG-58/U	Too lossy
LMR-240	Great, little advantage
RG-174, RG-316	Way too lossy
LMR-600	Great, too expensive
RG-59, RG-6	Wrong impedance

Antenna elements

- 14 AWG stranded (THHN is fine)
- 18 AWG stranded speaker wire
- Solid has lower loss, but
  - Solid tends to stretch
  - Solid tends to break easily
- Avoid Copperweld (copper-clad aluminum/steel)
  - Breaks easily and difficult to repair
  - A little awkward to use
- Aluminum tubing is terrific, but unwieldy when long

Velocity factor

Electrical RF energy travels close to the speed of light

How close?

Typically, 2/3 to 9/10 the speed of light

Actual VF quantities

- **Copper wire = 0.951**
- **Aluminum tubing = 0.94**
- **RG-58 coax = 0.66**
- **RG-8X coax = 0.82**
- **LMR-400 = 0.85**
- **300-ohm ladder line = 0.88**
- **450-ohm ladder line = 0.91**

Velocity factor example

Wire dipole for 40 meters (7.2 MHz)

300 ÷ 7.2 MHz = 41.67 meters (full-wave)

41.67 meters ÷ 2 = 20.83 meters (half-wave)

20.83 meters x (39.37 in / meter) = 820.2 in

820.2 inches ÷ (12 in / foot) = 68.35 feet

Resonant point around 6.85 MHz

That won't work well because it's too long

The VF for copper wire is 0.951, so

Please contact me

Noji Ratzlaff KNØJI
nojiratz@hotmail.com